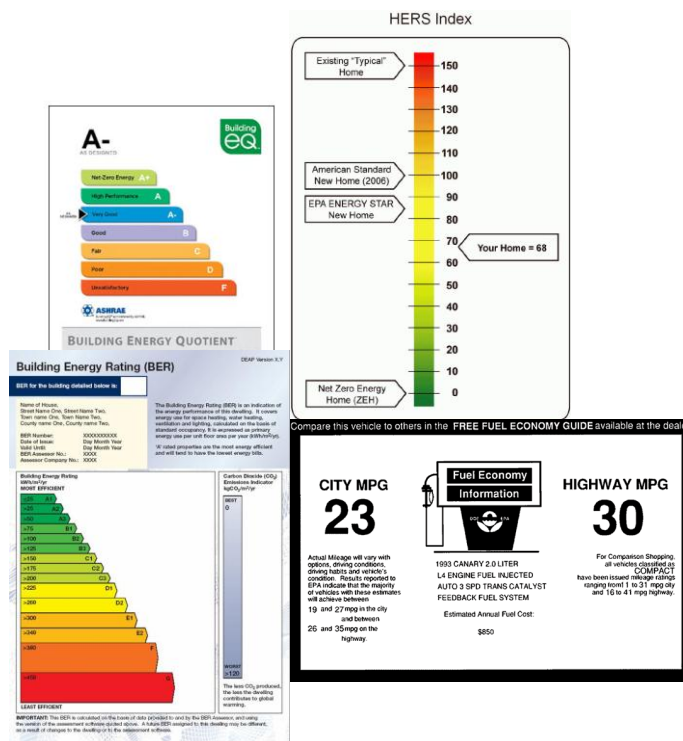


# An MPG Rating for Commercial Buildings:

## *Establishing a Building Energy Asset Labeling Program in Massachusetts*

A White Paper  
Prepared by the  
Massachusetts Department of Energy Resources



December, 2010

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## Preface

This progress report is a product of a collaborative effort led by the Massachusetts Department of Energy Resources (DOER) within the Executive Office of Energy and Environmental Affairs (EEA) and a team of public-private members (the Team), who contributed their time and experience in shaping the recommendations listed in this report. Although the Team members have assisted greatly in framing the discussion and offering feedback, the opinions expressed in this document are the sole opinions of the Massachusetts Department of Energy Resources.

This report was developed as a part of the National Governors Association Policy Academy on Building Retrofits (NGA Center), to which DOER submitted a proposal and was granted technical assistance support to develop a set of policy recommendations on building labeling for existing commercial buildings. Because of the complex issues associated with building labeling, this document is being submitted as a preliminary progress report that provides initial findings and recommendations to help the Commonwealth move forward on building energy labeling efforts. DOER anticipates ongoing review, amendments, and additions to this document over the next several months as it works with stakeholders to develop a pilot labeling program described later in this report.

Additional support was provided by Industrial Economics, Inc. (IEC), which was funded by the NGA Center to assist DOER with the development of this progress report.

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## Glossary

<b>ASHRAE</b>	The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, <a href="http://www.ashrae.org/">http://www.ashrae.org/</a>
<b>ASTM</b>	ASTM International, originally known as the American Society for Testing and Materials, <a href="http://www.astm.org/index.shtml">http://www.astm.org/index.shtml</a>
<b>BEERR</b>	The Building Energy Efficiency Recommendations Report
<b>BOMA</b>	The Building Owner's and Manager's Association, <a href="http://www.boma.org/Pages/default.aspx">http://www.boma.org/Pages/default.aspx</a>
<b>CB ECS</b>	Commercial Building Energy Consumption Survey, <a href="http://www.eia.doe.gov/emeu/cbecs/">http://www.eia.doe.gov/emeu/cbecs/</a>
<b>COMNET</b>	Commercial Energy Services Network, <a href="http://www.comnet.org/">http://www.comnet.org/</a>
<b>DOE</b>	The U.S. Department of Energy, <a href="http://www.energy.gov/">http://www.energy.gov/</a>
<b>DOER</b>	The Massachusetts Department of Energy Resources, <a href="http://www.mass.gov/doer">http://www.mass.gov/doer</a>
<b>EPA</b>	The U.S. Environmental Protection Agency, <a href="http://www.epa.gov/">http://www.epa.gov/</a>
<b>EPBD</b>	The Energy Performance of Buildings Directive, <a href="http://www.epbd-ca.org/">http://www.epbd-ca.org/</a>
<b>ESPM</b>	Energy Star Portfolio Manager, <a href="http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager">http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager</a>
<b>EU</b>	European Union
<b>EUI</b>	Energy Use Intensity
<b>GCA</b>	The Massachusetts Green Communities Act, <a href="http://www.mass.gov/legis/laws/seslaw08/sl080169.htm">http://www.mass.gov/legis/laws/seslaw08/sl080169.htm</a>
<b>GWSA</b>	The Massachusetts Global Warming Solutions Act, <a href="http://www.mass.gov/legis/laws/seslaw08/sl080298.htm">http://www.mass.gov/legis/laws/seslaw08/sl080298.htm</a>
<b>HERS</b>	Home Energy Rating System, <a href="http://resnet.us/">http://resnet.us/</a>
<b>IMT</b>	The Institute for Market Transformation, <a href="http://imt.org/">http://imt.org/</a>
<b>IREM</b>	The Institute of Real Estate Management, <a href="http://www.irem.org/">http://www.irem.org/</a>
<b>KBTU</b>	Thousand British Thermal Units
<b>LEED</b>	Leadership in Energy and Environmental Design, <a href="http://www.usgbc.org/DisplayPage.aspx?CategoryId=19">http://www.usgbc.org/DisplayPage.aspx?CategoryId=19</a>
<b>MEPA</b>	The Massachusetts Environmental Policy Act, <a href="http://www.env.state.ma.us/mepa/">http://www.env.state.ma.us/mepa/</a>
<b>NABERS</b>	The National Australian Built Environment Rating System, <a href="http://www.nabers.com.au/">http://www.nabers.com.au/</a>
<b>NAIOP</b>	The National Association of Industrial and Office Properties, <a href="http://www.naiop.org/">http://www.naiop.org/</a>
<b>NBI</b>	The New Buildings Institute, <a href="http://www.newbuildings.org/">http://www.newbuildings.org/</a>
<b>NBRP</b>	The National Building Rating Program, <a href="http://www1.eere.energy.gov/office_eere/pdfs/epa_doe_agreement.pdf">http://www1.eere.energy.gov/office_eere/pdfs/epa_doe_agreement.pdf</a>
<b>NEEP</b>	The Northeast Energy Efficiency Partnerships, <a href="http://www.neep.org/">http://www.neep.org/</a>
<b>RESNET</b>	Residential Energy Service Network, <a href="http://resnet.us/">http://resnet.us/</a>
<b>USGBC</b>	The U.S. Green Building Council, <a href="http://www.usgbc.org/">http://www.usgbc.org/</a>
<b>ZNEB</b>	Zero Net Energy Building, additional information can be found in the following link: <a href="http://www.mass.gov/?pageID=eoeesubtopic&amp;L=4&amp;L0=Home&amp;L1=Energy%2C+Utilities+%26+Clean+Technologies&amp;L2=Energy+Efficiency&amp;L3=Zero+Net+Energy+Buildings+(ZNEB)&amp;sid=Eoeea">http://www.mass.gov/?pageID=eoeesubtopic&amp;L=4&amp;L0=Home&amp;L1=Energy%2C+Utilities+%26+Clean+Technologies&amp;L2=Energy+Efficiency&amp;L3=Zero+Net+Energy+Buildings+(ZNEB)&amp;sid=Eoeea</a>

## Executive Summary

In recent years, the Commonwealth of Massachusetts has taken a number of steps to develop a variety of clean energy policies and programs that are leading the nation. As a result of a number of far-reaching pieces of legislation and ongoing innovative programs, Massachusetts is poised to make significant and meaningful reductions in energy use and greenhouse gas emissions. The building labeling recommendations outlined in this report are part of a set of potential strategies being considered to help achieve long term clean energy objectives.

The Global Warming Solutions Act, signed into law by Governor Deval Patrick in August 2008, requires an 80 percent reduction in statewide greenhouse gas emissions by 2050 from a 1990 baseline, with an initial target of 10-25 percent reduction by 2020. As the building sector in Massachusetts consumes over 50 percent of total state energy, and commercial and industrial buildings account for more than 60 percent of state electricity consumption, it is clear that reducing energy use in buildings will play a critical part in achieving emission reduction targets. Additionally, pursuant to the 2008 Green Communities Act, the Massachusetts Department of Energy Resources (DOER) and state electric and gas utilities have a mandate to pursue all cost-effective energy efficiency, which is resulting in a dramatic expansion of efficiency programs across all building sectors.

A building energy asset rating and labeling program, which is designed to facilitate a direct comparison of energy performance among similar buildings irrespective of tenant behavior, is one of the potential strategies to reduce energy use in the commercial building sector. In contrast to operational ratings, which are based on actual energy use (i.e. energy billing data), asset ratings evaluate the energy performance of the building based on the thermal envelope (e.g. insulation, windows) and mechanical and electrical systems, irrespective of tenant behavior. While operational data is critical for some programs (e.g. quantifying the effectiveness of efficiency measures), the goal of an asset rating is to provide the information necessary to enable the real estate market to value energy performance intrinsic to the building, resulting in increased energy efficiency investments. In the absence of an established U.S. commercial building asset rating program, rating and labeling efforts in the U.S. have focused solely on operational ratings.

In this context, DOER, with a team of public-private partners, submitted an application to, and was selected by, the National Governors Association's Policy Academy for Building Energy Retrofits (NGA Center) to receive technical assistance to help advance the development and implementation of a commercial building energy labeling program in Massachusetts for existing buildings. Massachusetts is proposing to develop and implement a building energy labeling program that includes both asset and operational energy ratings, and is integrated with utility funded energy efficiency programs. Through a two-three-year pilot, the goal is to demonstrate the ability of an energy label to drive further investment in energy efficiency within the commercial building sector.

This progress report is designed to fill the current gap and provide a framework for a statewide commercial building asset energy rating and labeling program and potentially inform a future national program. It presents a set of program design and pilot phase implementation recommendations, as well as a possible strategy for rolling-out a future statewide program. The Team considered three primary program design issues: the nature of the rating scale (i.e., *what* is being measured), the manner in which a rating is communicated (i.e., the label), and the process by which the necessary data and other information are collected and shared with program participants. Initial recommendations include:

### **Rating Scale**

- Use of a technical, rather than a statistical rating scale, which would rate buildings against a zero energy benchmark as opposed to comparing them solely to energy consumption of existing peer buildings.

- Use of site energy use intensity (EUI) as the basis for an asset rating, with a complementary greenhouse gas (GHG) emissions metric, rather than the use of a single metric that relies only on source energy.
- Adjustment of the asset rating scales to account for different building types, but initially minimizing the number of building type categories used.
- Use of guidelines to standardize inputs into energy modeling tools, such as the Commercial Energy Services Network (COMNET) guideline.

#### ***Label Information***

- Possible adoption of a letter grading system based on modeled EUI that makes building to building comparisons easy to understand for the intended audience.
- Design of a simple, visually appealing label that effectively communicates the letter grade, the site EUI, and a GHG emissions measure, and also includes key findings and recommendations for improvements.

#### ***Assessment Process***

- An initial on-site assessment akin to an ASHRAE Level II audit to establish a building's energy asset and performance baseline and to determine a preliminary set of efficiency recommendations.
- Integration of the recommendations with utility incentive and financing programs made available to building owners to support implementation of efficiency measures.
- Upon completion of a retrofit project, a post-retrofit re-assessment of the building to finalize the utility incentive award and provide a new asset rating grade.
- Development of standard data collection and data modeling protocols in collaboration with ASHRAE, COMNET, and other key stakeholders intended to improve modeling consistency and transparency.
- Development of quality assurance measures including, but not limited to, assessor training, energy modeling training, and certification programs with relevant stakeholders.
- Finalization of an energy rating standard that would be equally applicable to new and existing commercial buildings.

#### ***Pilot Program***

- A two-three year pilot that focuses on the office, multi-family rental, and public building sectors in the greater Boston area as well as several other municipalities across Massachusetts.
- Participation in the pilot on a voluntary basis.
- Creation of an "Energy Leaders" program to publicly recognize significant achievements in energy use reduction in existing buildings.

#### ***Future Statewide Implementation***

- Consider a transition from the pilot to a broader statewide program based on the results from and evaluation of the pilot.
- Establish a minimum size threshold (i.e. 10,000 square feet) to be included in a building energy labeling program.
- Develop a schedule for existing buildings to acquire an asset rating within 10 years of the program launch or following a specific "trigger event" (e.g., building sale, re-finance, or major renovation).
- Renewal of the building energy asset rating every 10-15 years, with specific events triggering earlier renewal.
- Periodic operational ratings to complement the asset rating.
- Development of a database to provide appropriate stakeholders with access to rating and label information in order to compare energy performance across buildings.

## Section 1: Introduction

### 1.1 Why a Commercial Building Asset Rating?

Building energy asset ratings are designed to facilitate direct comparisons of energy performance among similar buildings. In contrast to operational ratings, which are based on actual energy use (i.e. energy billing data), asset ratings evaluate the energy performance of the building based on the thermal envelope (e.g. insulation, windows) and mechanical and electrical systems, irrespective of tenant behavior. The goal of asset ratings is to educate stakeholders and enable the real estate market to value energy performance, thereby increasing investments in energy efficiency.

Programs requiring the public labeling of building energy performance are increasingly common across the industrialized world. For several years, the European Union (EU) has directed its member states to establish and implement building energy rating systems, and a similar program was adopted in 1997 in the Australian Capital Territory, and is now being developed into a national program. More recently, major U.S. cities such as Austin, Texas, New York, and Washington D.C. have established requirements for commercial buildings to determine and disclose operational energy ratings. However, in the absence of an established U.S. commercial building asset rating program, efforts in the U.S. have focused solely on operational ratings.

Consequently, this progress report is designed to “fill the gap” and provide a framework for developing a U.S. asset rating. The following sections provide additional rationale on the need for an asset rating, examine a number of critical technical and programmatic issues, and present a set of preliminary recommendations.

#### ***A. LEED as a proxy for an Energy Asset Rating***

The concept of labeling a new building’s assets is not new to the U.S. commercial real estate market. Certification of new buildings under the U.S. Green Building Council’s (USGBC) Leadership in Energy and Environmental Design (LEED) is increasingly common within the commercial building sector. Because the energy optimization section for LEED certification requires minimum levels of energy savings and allocates points for going beyond minimum requirements, LEED certification levels (e.g. Platinum vs. Silver, etc.) have often been viewed as a proxy for an energy performance label.

However, because the LEED rating is based on points from eight categories, one of which addresses energy performance (“Energy & Atmosphere” category), a LEED rating is not necessarily representative of the relative energy performance of a building. In addition, while LEED energy modeling constitutes an asset based approach by predicting energy use of a building compared to the same building designed to meet code, LEED is expressly designed to be building-specific and as such does not allow for comparisons of energy use across multiple buildings.

Although the USGBC is working to minimize energy variability among similar buildings, the LEED approach has often resulted in buildings with the same LEED rating having widely varying projected energy use. As such, LEED is not designed for the purpose of making comparisons of energy performance between buildings. These conclusions were supported in a report issued by the New Building Institute (NBI) for the USGBC, stating that “Within each of the metrics, measured performance displays a large degree of scatter, suggesting opportunities for improved programs and procedures. Measured EUIs for over half the projects deviate by more than 25%



from design projections, with 30% significantly better and 25% significantly worse. A handful of buildings have serious energy consumption problems.”<sup>1</sup>

Recently, the USGBC created a new operational rating, LEED for Existing Buildings, Operations and Maintenance (LEED-EB:OM) system, which requires the tracking of the building’s operational performance, using the U.S. Environmental Protection Agency’s (EPA) Energy Star Portfolio Manager (ESPM) tool. While LEED now provides both an asset rating and an operational rating, neither serves as the basis for a label that compares energy performance across commercial buildings.

### **B. Energy Star Portfolio Manager**

The EPA Energy Star Portfolio Manager (ESPM) is another popular rating tool within the U.S. commercial real estate market. The ESPM is designed as an operational energy rating tool that allows building owners or operators to compare their actual building energy use with energy use in similar buildings in the same climate zone, as derived from the U.S. Department of Energy’s (DOE) CBECS. As an operational rating the ESPM is a reasonably effective tool; however, for a number of reasons, CBECS data are limited in their usefulness as a basis for generating energy asset ratings. CBECS collects operational energy use data, and only a subset of the building characteristics that would be needed for an asset rating. In addition, the CBECS data updates occur only once every four years and the energy data used to generate energy usage comparisons are gathered from a sample size of approximately 5,000 buildings nationwide, or 0.1 percent of the total commercial building market.<sup>2</sup> The DOE acknowledges that “due to sample size and confidentiality issues, State-level estimates (or anything geographically smaller) are not available.”<sup>3</sup> Attempts to use CBECS data as a benchmark for less common building types (e.g., laboratories) are similarly constrained by the lack of a sample size sufficient for the data to be representative.

Additionally, ESPM is designed as a comparative rating system that generates a percentile score against the mean of existing buildings. As a result, ESPM scores present a historical benchmark rather than a forward-looking rating. This choice of a statistical rather than a technical scale makes the ESPM less well suited to a program designed to educate consumers about what is possible, and drive future expectations and actual energy consumption significantly downward towards zero net energy use, which, at least in Massachusetts and California, is the long-term policy goal.

Given the difficulty in developing an energy rating system and the lack of any other recognized national program, ESPM is currently the most widely used operational rating system. However, ESPM by itself is insufficient to measure the potential energy performance of the building based on the design of a building’s envelope and systems. The ESPM rating alone provides a weak proxy to link the likely energy performance of a building to its financial value in the real estate market, where tenancy is likely to change, and is therefore a less than optimal tool if the goal is to motivate greater energy efficiency investments.



An Energy Star Plaque,  
source: [www.energystar.gov](http://www.energystar.gov)

<sup>1</sup> Turner, C., & Frankel, M. (2008, March 4). Energy Performance of LEED® for New Construction Buildings. USGBC. [www.usgbc.org/ShowFile.aspx?DocumentID=3930](http://www.usgbc.org/ShowFile.aspx?DocumentID=3930)

<sup>2</sup> Buonicore, A. J. (2010, April 5). The Formidable Challenge of Building Energy Performance Benchmarking. *Building Energy Performance News*. <http://blog.bepinfo.com/2009/10/challenge-of-building-energy.html>

<sup>3</sup> Frequently Asked Questions about the Commercial Buildings Energy Consumption Survey (CBECS) . (n.d.). U.S. Energy Information Administration. <http://www.eia.doe.gov/emeu/cbecs/faq.html>

### **C. Market valuation and the Role of Asset Ratings**

To accomplish the goal of integrating energy performance into the commercial real estate market valuation process, it is necessary to provide an asset rating information to the commercial building financial community. Only an asset rating that evaluates the building infrastructure and systems separate from usage associated with occupancy and operations will provide the real estate market with an “apples to apples” comparison among like buildings, leading to greater financial incentives to make efficiency investments.

Combining an asset rating with an operational rating can provide detailed information that can enable building operators, owners and tenants to identify, prioritize, and justify energy investments and strategies. Ultimately, a comprehensive and effectively implemented commercial building rating and labeling system should result in more interest in energy efficiency and greater numbers of efficiency projects actually implemented.

#### **1.2 NGA Policy Academy on Building Energy Retrofits**

In recognition of the value in developing an asset rating system as part of a building energy labeling program, the National Governors Association’s Center for Best Practices (NGA Center) selected Massachusetts to participate in its Policy Academy for Building Energy Retrofits. Supported in part by the NGA Center, Massachusetts formed a team comprised of representatives from utilities, municipalities, building property management firms, design and engineering firms and a law firm, to begin the process of identifying and addressing the barriers to a commercial building labeling program. Prior collaborative projects by the DOER, including the final report of the Massachusetts Zero Net Energy Buildings (ZNEB) taskforce<sup>4</sup> and a rating and labeling roadmap for the Northeast prepared for the Northeast Energy Efficiency Partnership (NEEP) by Dunskey Energy Consulting in collaboration with the Vermont Energy Investment Corporation,<sup>5</sup> provided a foundation for the Team’s work. Continuing the work that these two reports initiated, the Team engaged with international labeling experts from the EU and Australia, as well as national organizations such as the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), Commercial Energy Services Network (COMNET), and other stakeholders to expand the existing knowledge base and to begin framing a building labeling roll-out plan.

This progress report marks the completion of Massachusetts’ participation in the NGA Policy Academy and is intended to:

- Establish a rationale for a building labeling program,
- Describe alternative pathways for moving such a program forward, and
- Foster discussion among the key stakeholders.

The following sections of the report describe current labeling initiatives in other jurisdictions; present the Massachusetts context within which DOER is developing a labeling program; define and discuss the critical technical issues associated with an asset rating; and, in light of those technical issues, present a proposed implementation strategy, beginning with an initial, pilot effort.

#### **1.3 National and International Efforts**

<sup>4</sup> Getting to Zero: Final Report of the Massachusetts Zero Net Energy Buildings Task Force. (2009, March 11). *The Massachusetts Executive Office of Energy and Environmental Affairs*. [http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb\\_taskforce\\_report.pdf](http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb_taskforce_report.pdf)

<sup>5</sup> Dunskey, P., Lindberg, J., Piyalé-Sheard, E., & Faesy, R. (2009, November 1). A Roadmap for the Northeast U.S.: Valuing Building Energy Efficiency through Disclosure and Upgrade Policies. *Northeast Energy Efficiency Partnerships*. [http://www.neep.org/uploads/policy/NEEP\\_BER\\_Report\\_12.14.09.pdf](http://www.neep.org/uploads/policy/NEEP_BER_Report_12.14.09.pdf)

In evaluating and identifying options for a building energy labeling program, the Team explored a range of comparable efforts both within the U.S. and internationally. The following is a summary of the information and key findings drawn from this research.

### A. EU Energy Performance of Buildings Directive (EPBD)

In 2002, the EU adopted the “Energy Performance of Buildings Directive” (EPBD) (2002/91/EC), which required all EU member states to establish and implement a building energy labeling program for residential and commercial buildings above a certain size (1,000 m<sup>2</sup>, or more than 10,000 ft<sup>2</sup>). In May 2010, the EU adopted an updated Directive (2010/31/EU), which provided a more detailed guidance for Member States and notably removed the building size threshold, thereby increasing the Directive’s scope.<sup>6</sup> Under the revised Directive, all new buildings in the EU, beginning in 2020, will have to consume “nearly zero” energy and will be expected to derive most of their energy needs from on-site or nearby renewable energy sources. Another important change is the decision to require a consistent method to calculate building energy grades in order to standardize minimum building energy performance across Member States.

During its research phase, the Team received input from leading EU authorities and experts, including Martin Elsberger, the Directorate General of the EU Energy and Transport European Commission; Kirsten Engelund Thomsen from the Danish Building Research Institute; Christiane Egger, Deputy Manager of the Upper Austria Renewable Energy Agency; and Bill Bordass, a labeling expert based in the United Kingdom. Several key findings emerged from these discussions:

- The EU nations have adopted energy labels based on a technical scale, using a grade based system calibrated and set without the use of a database of energy data such as CBECS.<sup>7</sup>
- While Denmark uses only an asset rating for its labeling program, Thomsen suggested that a preferred approach would include both an asset and operational ratings.
- The Danish program has only two scales, one for residential buildings and one for commercial buildings. While most labeling programs utilize a range of scales associated with different building types, Denmark chose this approach in order to satisfy its goal of creating a simple, easy to use metric.
- In Austria, each constituent state implements an independent program. Upper Austria, home to one of the oldest labeling programs in the country, stresses the need to engage all stakeholders from the earliest stages of the labeling process.
- The labeling programs in Portugal and Ireland are considered to be particularly successful. Additional outreach to officials in these countries would be beneficial as program development in Massachusetts moves forward.



Source: The Energy Performance of Buildings Directive Community, [www.buildup.eu](http://www.buildup.eu)

<sup>6</sup> Directive 2010/31/EU. (2010, May 19). *EUR-Lex: Access to European Union law*. <http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2010:153:SOM:EN:HTML>

<sup>7</sup> EN 15217 "Energy performance of buildings – Methods for expressing energy performance and for the energy certification of buildings." (2009, May 16). *Buildup.eu*. <http://www.buildup.eu/publications/7136>

### ***B. Australian Labeling Program (NABERS)***

Australia recently passed the Building Energy Efficiency Disclosure Bill 2010<sup>8</sup> which, under the Commercial Building Disclosure scheme (CBD scheme), requires owners and renters of commercial office space with a net area of over 21,000 ft<sup>2</sup> (2,000 m<sup>2</sup>) to disclose an energy efficiency rating (currently, only operational rating) to prospective purchasers and tenants when the space is to be sold, leased, or subleased. This mandatory program is based on an existing system, the National Australian Built Environment Rating System (NABERS). Implementation of the mandatory program will occur in phases. The Team plans to reach out to the Australian agencies responsible for implementing this program, specifically to learn more about their labeling program management and marketing outreach.

### ***C. EPA and DOE's National Labeling Efforts***

In late 2009, DOE and EPA signed an agreement clarifying their respective roles in the joint development of a National Building Rating Program (NBRP). This new program will create additional rating tools and labels for both the residential and commercial building sectors. Under the agreement, EPA will continue to be responsible for the ESPM while DOE will manage the NBRP and will lead the effort to create new asset and operational rating tools. The Team will work closely with DOE while developing and piloting a Massachusetts-specific toolkit. The MA pilot program is designed to contribute to the development of a scheme that is more national in scope.

### ***D. Other U.S. Jurisdictions Labeling Efforts***

Building energy performance benchmarking initiatives are also ongoing in New York City, Washington, DC, and Austin, TX as well as in California and Washington State.

- In New York City, enactment of the “Greener, Greater Buildings Plan” in late 2009 created a requirement for owners of existing buildings (with an area greater than 50,000 square feet) to conduct an energy audit and retro-commissioning of building systems once every 10 years unless they meet certain performance or design requirements. In addition, ENERGY STAR benchmarking and disclosure became required for private and city buildings larger than 50,000 and 10,000 square feet, respectively, with information to be posted to a public, online database.<sup>9</sup>
- In Washington, DC, the 2008 Clean and Affordable Energy Act created an annual energy performance (ENERGY STAR) rating and public disclosure requirement (via an online database, beginning in 2012) for private nonresidential buildings. The requirement applies initially to buildings at least 200,000 square feet in size, with the size decreasing by 50,000 square feet each year for two- three years. Ratings and disclosures are also required for all public buildings at least 10,000 square feet in size.<sup>10</sup>
- In June 2009, the Austin, TX Energy Conservation Audit and Disclosure Ordinance became effective with requirements for (1) energy audits of residences with four or fewer units, including all single-family homes, prior to the sale of the property; (2) energy audits for apartment buildings, with the audit results posted within the building and provided to prospective tenants and buyers; and (3) ENERGY STAR (or comparable) ratings for nonresidential buildings, with disclosure to prospective buyers prior to a sale.<sup>11</sup>

<sup>8</sup> The National Australian Built Environment Rating System (NABERS). (n.d.). *NABERS*. Retrieved August 1, 2010, from [www.nabers.com.au/](http://www.nabers.com.au/)

<sup>9</sup> New York City Rating. (n.d.). Institute for Market Transformation. <http://www.imt.org/rating-nyc.html>

<sup>10</sup> Washington, DC Area Rating. (n.d.). Institute for Market Transformation. <http://www.imt.org/rating-dc.html>

<sup>11</sup> Austin, TX. Rating. (n.d.). Institute for Market Transformation. <http://www.imt.org/rating-austin.html>

- In California and Washington, owners of nonresidential buildings are now required to determine ENERGY STAR ratings for their buildings and to disclose the rating to prospective buyers, lessees and lenders prior to the closing of a transaction.<sup>12</sup>

It is important to note that all current initiatives in the U.S. are based on operational ratings.

## 1.4 Massachusetts Context

In Massachusetts, building energy consumption accounts for over 50 percent of the state's total greenhouse gas (GHG) emissions, and commercial and industrial buildings in turn account for over 60 percent of total state electricity consumption. In order for the Commonwealth to reach its legislatively mandated commitments as specified in the 2008 Global Warming Solutions Act (see below), significant efficiency-related investments in commercial properties will have to grow significantly and be sustained over the next four decades.

Efforts to promote energy efficiency in the building sector is already occurring at the state and municipal levels as part of broader climate change mitigation strategies. These efforts, several of which are described below, create a strong foundation for the development and implementation of a labeling program.

### A. State Legislation and Regulation

Massachusetts has recently enacted several pieces of major legislation and regulation that respond directly to state and national energy and environmental challenges. Three in particular target improvements in building energy performance.

#### 1. The Green Communities Act

The 2008 Green Communities Act (GCA), a comprehensive energy reform bill, established a new framework for energy policy in Massachusetts. DOER and agency partners are engaged in a variety of building energy efficiency initiatives and are collaborating with the state's utility companies to expand energy efficiency investment and programming across the Commonwealth in all sectors.

#### 2. The Global Warming Solutions Act

The Global Warming Solutions Act (GWSA), signed into law by Governor Deval Patrick in August 2008, requires an 80 percent reduction of greenhouse gas emissions economy-wide in Massachusetts by 2050, with a 2020 target of between 10 and 25 percent below 1990 levels to be set by January 1, 2011. With the passage of the law, Massachusetts became one of the first states in the nation to move forward with a comprehensive regulatory program to address climate change.

#### 3. The Massachusetts Environmental Policy Act

The Massachusetts Environmental Policy Act (MEPA) requires that all large development project proponents undertake an assessment of project impacts and alternatives in an effort to avoid, minimize, and mitigate "damage to the environment" to the maximum extent feasible. Building on this general requirement, the MEPA Greenhouse Gas Emissions Policy and Protocol, established in 2007, requires certain projects undergoing review by the MEPA Office to quantify their projected GHG emissions and identify measures to avoid, minimize, or mitigate such emissions. In addition to quantifying project-related GHG emissions, the Policy also requires proponents to evaluate project alternatives that may

<sup>12</sup> California and Washington State Ratings. (n.d.). Institute for Market Transformation. <http://www.imt.org/rating-california.html> and <http://www.imt.org/rating-washington.html>

result in lower GHG emissions and to quantify the projected emissions and energy impacts of proposed mitigation.

### **B. Municipal Climate and Energy Initiatives**

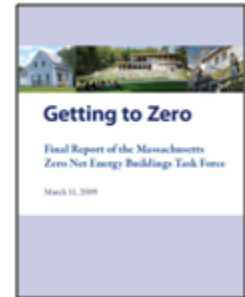
Many Massachusetts communities are taking a leadership role in addressing climate and energy concerns at the local level. Sixty-two communities have adopted the Massachusetts “Stretch Energy Code,” which sets the minimum energy performance for all new buildings at 20 percent better than national model energy codes. Thirty-five communities have been designated as “green communities” by DOER as a result of their adoption of various climate and energy commitments. Boston and Cambridge in particular have demonstrated leadership in this area and both communities have adopted broad climate change action plans that include recommendations to implement commercial and residential building energy labeling programs.<sup>13</sup>

### **C. ZNEB Task Force Report**

In March 2008, Governor Deval Patrick established a Zero Net Energy Buildings Task Force to develop recommendations to move the Commonwealth toward universal adoption of zero net energy buildings by 2030. Comprised of more than 70 building and energy experts from the public and private sector, the Task Force’s final report presented a total of 44 recommendations across four general categories.<sup>14</sup>

- 1) Establishing minimum performance standards based on energy use per square foot;
- 2) Benchmarking, reporting, and tracking energy use data for all buildings;
- 3) Creating incentives to help address regulatory and financial barriers; and
- 4) Launching workforce development and public education initiatives.

One of the report’s key recommendations is the development of a building energy labeling program.



The Massachusetts Zero Net Energy Buildings Task Force,  
Source: [www.mass.gov/doer](http://www.mass.gov/doer)

### **D. NEEP/ Dunsky Building Labeling Report**

In November 2009, NEEP released a report entitled “Valuing Building Energy Efficiency through Disclosure and Upgrade Policies.”<sup>15</sup> The report provides guidance to states in the Northeast on the role of building energy labeling programs as a means to improve energy efficiency in the existing building stock. Based on a review of current international and national initiatives, the report outlines several recommendations, including:

- To be effective, disclosure should be mandatory.
- Rating costs will have to come down to be politically acceptable.
- Commercial buildings should use both asset and operational ratings.
- States and utilities should collaborate to build market demand, and should consider reaching out to industry associations such as BOMA, IREM, NAIOP, and others.

<sup>13</sup> Sparking Boston's Climate Revolution: Recommendations of the Climate Action Leadership Committee and Community Advisory Committee. (2010, April 1). *The City of Boston*. [http://www.cityofboston.gov/Images\\_Documents/BCA\\_full\\_rprt\\_f2\\_tcm3-16940.pdf](http://www.cityofboston.gov/Images_Documents/BCA_full_rprt_f2_tcm3-16940.pdf). City of Cambridge Climate Protection Plan. (n.d.). *City of Cambridge*. [http://www.cambridgema.gov/cdd/et/climate/clim\\_plan/clim\\_plan\\_full.pdf](http://www.cambridgema.gov/cdd/et/climate/clim_plan/clim_plan_full.pdf)

<sup>14</sup> Getting to Zero: Final Report of the Massachusetts Zero Net Energy Buildings Task Force. (2009, March 11). *The Massachusetts Executive Office of Energy and Environmental Affairs*. [http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb\\_taskforce\\_report.pdf](http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb_taskforce_report.pdf)

<sup>15</sup> Dunsky, P., Lindberg, J., Piyalé-Sheard, E., & Faesy, R. (2009, November 1). A Roadmap for the Northeast U.S.: Valuing Building Energy Efficiency through Disclosure and Upgrade Policies. *Northeast Energy Efficiency Partnerships*. [http://www.neep.org/uploads/policy/NEEP\\_BER\\_Report\\_12.14.09.pdf](http://www.neep.org/uploads/policy/NEEP_BER_Report_12.14.09.pdf)



The Team is using this report as a key resource and expects to build on several of its recommendations as its efforts move forward.

#### ***E. Massachusetts Home Energy Labeling and Energy Retrofit Pilot***

In September 2010, the U.S. Department of Energy awarded Massachusetts and three other states \$11.8M to catalyze the home energy retrofit market and demonstrate a national home energy label. Massachusetts' three-year pilot will target one and two family homes in seven Western Massachusetts communities—Springfield, Longmeadow, East Longmeadow, Hampden, Wilbraham, Palmer, and Belchertown. The core components of this pilot include providing an “energy label” that reflects a home’s “energy performance” both before and after upgrading the home as well as an online tool that allows homeowners to easily and automatically obtain bids from contractors, matched to nation-leading financing and incentives for efficiency upgrades.

#### ***F. ASHRAE Building EQ National Pilot***

DOER is participating in ASHRAE’s national building labeling pilot program, *Building EQ*, which includes both operational and asset rating elements. The Commonwealth enlisted five buildings (public and private) in the operational rating phase of the pilot and each received an operational rating report earlier this year. To arrive at a rating, the ASHRAE assessors evaluated each building with respect to its basic characteristics, design and operational features, annual energy use by fuel type, thermal comfort, lighting quality, and indoor air quality. The asset rating phase of the pilot is expected to begin in the fall of 2010. Massachusetts intends to enlist at least four of the five buildings to participate in the asset rating phase. In addition, DOER has joined the ASHRAE sub-committee that is developing the program for the asset rating pilot phase, and is actively engaged in discussions surrounding key questions, such as the relative merits of alternative asset rating metrics. DOER expects to give serious consideration to the adoption of the ASHRAE program as the basis for the Commonwealth’s rating and labeling system.



The John W. McCormack Building in downtown Boston was one of three state buildings to participate in the ASHRAE bEQ Pilot.

Source: Massachusetts Bureau of State Office Buildings

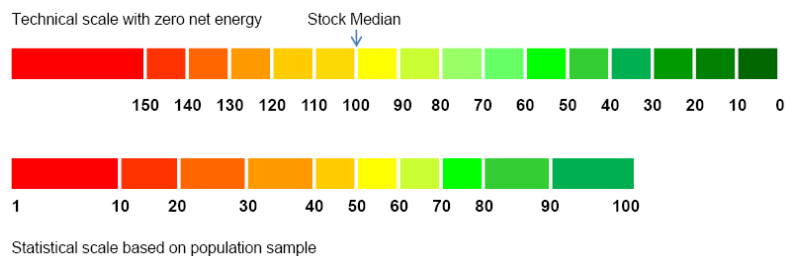
## Section 2: The Asset Rating – Technical Issues

Development of an asset rating and labeling system requires consideration of three primary technical issues: the nature of the rating scale (i.e., *how and where* grades/ scales are set), the manner in which a rating is communicated, and the process by which the necessary data and other information are collected and shared with program participants.

### 2.1 Rating Scale

#### A. Technical Scale vs. Statistical Scale

**Discussion:** A statistical rating scale rates a building in comparison to its peers, whereas a technical rating scale compares a building's energy performance to technical potential reference points, such as zero net energy performance. The ESPM rating, for example, is a statistical rating using the CBECS database of building energy consumption, resulting in a comparative energy score.



Comparison of Technical and Statistical Scales,  
Source: "ASHRAE Building Energy Labeling Program: Implementation Report (FINAL DRAFT)"

**Recommendation:** The Team believes the ultimate goal of an asset rating is to influence building design and drive energy use as close to zero net energy as is technically feasible. As such, it recommends using a technical scale with the highest grade/score representing zero net energy performance (or better). Buildings are proposed to be rated in comparison to a median score determined for representative building types (see below).

#### B. Establishing the Technical Scale

**Discussion:** In addition to setting Zero as the benchmark target, a technical scale requires an additional calibration point that allows you to develop a rating scale to communicate relative building energy performance. The Team has identified the following ways to accomplish this:

- Use the information gathered in the CBECS database to obtain a median energy use by building type, normalized for climate and operational characteristics (occupancy schedule, computer use, etc.). The rating would be calculated by modeling the existing building assets and comparing the modeled energy use to the median.
- Calculate the median based on a building designed to meet code (e.g., ASHRAE 90.1-2007) using the existing building orientation configuration and basic design elements (e.g., percent glazing). The rating would be calculated by comparing the median against the building's projected performance, obtained through a new energy model of the actual components and equipment in the existing building.
- Identify an appropriate energy use target by building type based on reasonable expectations of energy use and compare that to the building's modeled energy use. An example of such an energy use target might be DOE's commercial benchmarks, which calculate projected energy use for each



of 16 building types by climate zone, assuming construction using best available practices and compliance with ASHRAE's 90.1-2004 building standard.<sup>16</sup>

- Follow the EU model of using professional judgment to select what is considered to be an appropriate median measure of energy use intensity.

***Recommendation:*** As stated earlier, the Team believes it would be inappropriate to rely on a statistical scale that establishes a building's rating based on a comparison to other buildings' energy performance. Additionally, because the Team believes that the rating label should influence building design, it does not believe that a median target that changes based on building design is appropriate. Therefore, the Team recommends establishing a fixed energy target that sets a standard metric for each building type. The Team is currently considering the use of DOE's commercial benchmarks and will work with DOE to ensure that they would be appropriately applied in a Massachusetts context.

### ***C. Site Energy Use Favored***

***Discussion:*** Consensus does not exist nationally on the question of whether to use source energy or site energy as the basis for calculating an energy use index. The Team believes that the energy metric that is of most interest to building owners and operators when comparing buildings, and informing decision-making around investments in the energy performance of the building, is site energy use per square foot (a site EUI), as this serves as a durable proxy for cost over time. This will provide the building owner with the information about the actual usage over which the building owner/ operator has direct control and can incorporate in planned building upgrades, whereas both energy prices and emissions factors used in source energy metrics are likely to fluctuate over time. That being said, source energy, which reflects a building's overall primary energy needs, better incorporates the associated environmental impacts, from emissions associated with a building's energy use. When only one metric is considered a case can be made for source energy as the best compromise, between the contrasting goals of reflecting a buildings emissions profile and its energy costs in a way that can remain comparable over a period of a decade or longer. As an alternative to this compromise around a single metric, the group has discussed using two ratings on the label: site energy as a primary metric to determine a building's energy use and a separate GHG emissions metric as a more precise alternative to source energy for the purpose of comparing the emissions profile associated with different buildings.

***Recommendation:*** While the Team remains open to additional input on this complex issue, it currently recommends using site energy as the primary performance metric for a commercial building labeling program. Key reasons include matching consumer expectations of what a label includes, and gaining the widest acceptance of the labeling system. It also permits cross regional building comparisons that are not skewed by wide variations in the electric generation portfolio mix in different parts of the country. However, should site energy be selected as the primary metric, the Team feels it is imperative to display an additional companion greenhouse gas emissions metric calculated based on regional electric emissions factors, providing a more targeted alternative to reporting energy use on a source energy basis.

### ***D. Multiple Building Categories***

***Discussion:*** The Team sees at least four options for developing a list of building categories for performance metrics:

1. Adopt the ESPM list of 14 building categories. The data for these categories are derived from the CBECS database, which must be updated by surveying thousands of buildings every four years.

<sup>16</sup> P. Torcellini, M. Deru, B. Griffith, K. Benne, M. Halverson, D. Winiarski, & D.B. Crawley. DOE Commercial Building Benchmark Models. (2008, July 10). *National Renewable Energy Laboratory*. <http://www.nrel.gov/docs/fy08osti/43291.pdf>

2. Adopt the categories in DOE's suite of commercial building benchmarks, which are based on models that incorporate best practices and normalize for operational use.
3. Combine some of the categories from the ESPM and/or DOE lists in order to reduce the number of categories and simplify the rating tool. For example, ESPM treats small, medium and large office buildings differently, so one option might be to combine all offices into one category.
4. Develop one performance target for all buildings, as is the practice in Denmark.

**Recommendation:** While the Team supports developing more than one performance scale in order to account for the wide variability of energy use across building types, it recommends exploring the combination of multiple building categories into a smaller number of common scales. For mixed-used buildings, the Team recommends continuing the standard practice of determining Energy Use Intensity (EUI) based on an area weighted average. For the early stages of a labeling program, the Team recommends starting with a small number of building types for which the relevant information and data are sufficient to ensure confidence in the appropriateness of the resultant scales (e.g., offices, multi-family residences, and schools). The Team also recommends accounting for the building types where the assessment triggers, discussed below, are likely to occur sooner. Over time, the Team recommends development of scales sufficient to cover the majority of building types.

### ***E. COMNET Data Normalization***

**Discussion:** A building's climate zone and certain operational characteristics (e.g., operating hours, number of occupants) are significant factors in energy performance. Development of a valid asset rating must be able to standardize these elements in order to ensure that comparisons between buildings are accurate. While all building model tools require operational assumptions and designation of climate zones, it is clear that wide variability exists between modeling tools.

**Recommendation:** The Team recommends requiring use of the COMNET modeling guidelines to standardize inputs into the modeling tools. Accounting for climate variability is relatively simple and can be incorporated into all ratings assuming such variability is deemed meaningful.

## **2.2 The Label**

### ***A. Both Operational and Asset Ratings***

**Discussion:** While the Team is focusing on the development of an asset rating, it recognizes the value of also providing an operational rating that will give building owners and operators additional information about a building's performance that includes operational behaviors and characteristics. Together, asset and operational ratings provide the ability to compare a building's potential energy performance with its actual energy use, enabling building operators and owners to prioritize actions that will reduce energy use. Additionally, operational ratings of existing buildings can be used to improve the accuracy of energy models used to create asset ratings.

Currently, ESPM is the most common tool for measuring operational performance in commercial buildings. However, some efforts are underway (e.g., ASHRAE bEQ) to develop an alternative operational rating that would use a performance metric rather than a statistical scale, require an on-site assessment, and result in a letter grade rather than a percentile ranking.

**Recommendation:** The Team is focused on the development of an asset rating but is committed to the complementary use of an existing operational rating. The Team will continue to work with ASHRAE to develop an appropriate operational labeling system. The Team advocates for obtaining both an operational and asset

label at the same time and presenting them together so that building operators can immediately understand the characteristics of their buildings' energy performance.

## B. Rating System

**Discussion:** An asset rating can be presented on a label in a number of different ways. Examples of possible label presentations include:

- A number that represents the building's modeled annual energy use, such as kBtu or kW per square foot.
- A scale that converts modeled energy use into a letter grading system.
- An indexed scale similar to the Home Energy Rating System (HERS).
- A non-numeric indicator that uses symbols such as stars or globes to represent performance.
- A horizontal bar that indicates where a building sits in comparison to other buildings, much like the label used in the U.S. to illustrate the relative energy use of major appliances and the recently developed DOE Home Energy Score (HES).



Numbering systems can be confusing; for example, “low” scores may not be universally understood to be “good” or “bad.” Indexes require the intended audience to understand the point of reference, which may not be obvious. Symbols can be effective, although their meaning is not always recognized by the public and it may take substantial education to ensure that stakeholders understand how the system works. A letter grade can effectively communicate the appropriate scale but can be difficult to gain acceptance given the negative perception of average or low grades. The bar system is helpful but may not allow stakeholders to directly and simply compare building performance and requires more complete and current information about performance at both ends of the scale. A key consideration is the target audience, which varies in its sophistication and interests. Building engineers, real estate appraisers, and citizens concerned about energy efficiency may each prefer different labeling systems.

Two examples of possible label presentations: a star scale (Australia), source: [www.nabers.com.au](http://www.nabers.com.au) and a horizontal bar with a number scale (Residential, U.S. DOE), source: [www.doe.gov](http://www.doe.gov)

**Recommendation:** As a primary objective, the Team strongly supports development of a labeling scheme that makes comparisons easy for the widest possible target audience to understand. Recognizing the pros and cons associated with each of the available options, the Team will continue its outreach to stakeholders in order to gain a better understanding of the trade-offs. The Team does note, however, that it is currently leaning toward recommending a letter grade system that is based on modeled EUI.

## C. Various Label Elements

**Discussion:** While the label might want to convey more than one piece of information, it is important to ensure that the label provides simple, easily accessible information on the asset rating of the building that can be easily understood by different audiences. Some examples of relevant information that a label might display include: a letter grade, a site EUI, annual greenhouse gas emissions, and one or more comparisons (e.g., median score(s) for that building type). The design can emphasize the relative importance of each information element.

**Recommendations:** The Team recommends careful consideration of design elements that together result in a simple, visually appealing label that emphasizes the primary asset rating metric, but specifically includes a letter grade, a site EUI, and GHG emissions measure. In addition to the label graphics, the label should also contain a text box summarizing the key findings and recommendations for improvements included in a broader report (see below). The Team will engage with marketing experts to design a clearly understandable label.

#### ***D. Energy Efficiency Recommendations***

**Discussion:** To make an asset label effective in leading to greater energy efficiency investments, it is critical to ensure that building owners and operators are provided with recommendations on where the significant opportunities to improve energy performance exist, and possible options for achieving such improvements. Two main products should result from the rating process: 1) an asset label, and 2) a building energy efficiency recommendations report (BEERR).

The BEERR is intended to document the current energy performance of the building and provide a comprehensive and prioritized list of recommendations for energy efficiency measures to be implemented in order to improve energy performance and subsequently achieve a higher grade. In addition, the BEERR could be designed to associate the recommended measures with the expected grade improvement.

**Recommendations:** Recommendations for the BEERR are presented below Section 2.3(C).

### **2.3 Assessment Process**

#### ***A. Pre- and Post-Retrofit Assessments***

**Discussion:** The primary goal of introducing an asset rating is to increase the number and depth of building energy efficiency retrofits in order to achieve reductions in energy use and GHG emissions. An initial asset rating and label may not be sufficient to motivate adoption of efficiency retrofits. While the peer comparisons built into an initial label may be effective at motivating the market to consider deep energy retrofits, actual implementation will often depend on the availability of financing or the ability to streamline the process of undertaking efficiency improvements. Financing in particular might require completion of a post-retrofit assessment. Whether assessments occur before, or before and after, a retrofit, the process should be sensitive to the magnitude of assessment costs and to any potential disruption of building owner and occupant activities, and should clearly articulate labeling triggers, the scope of the assessment, and whether third-party assessors are required to ensure the validity of their work.

**Recommendation:** The Team proposes to conduct an initial on-site ASHRAE Level 2 assessment to establish a building's energy asset and performance baseline. This assessment would document existing conditions and operational characteristics necessary to generate both an asset and operational rating and would include a preliminary set of efficiency recommendations (short of a BEERR) that would include projected energy and cost savings. These recommendations would be integrated with utility incentive and financing programs made available to building owners to support implementation of efficiency improvements. Upon completion of a retrofit project, the same assessor would conduct a post-retrofit re-assessment of the building and its asset rating, which would determine the final incentive level awarded.

#### ***B. Simple, Standardized Data Collection***

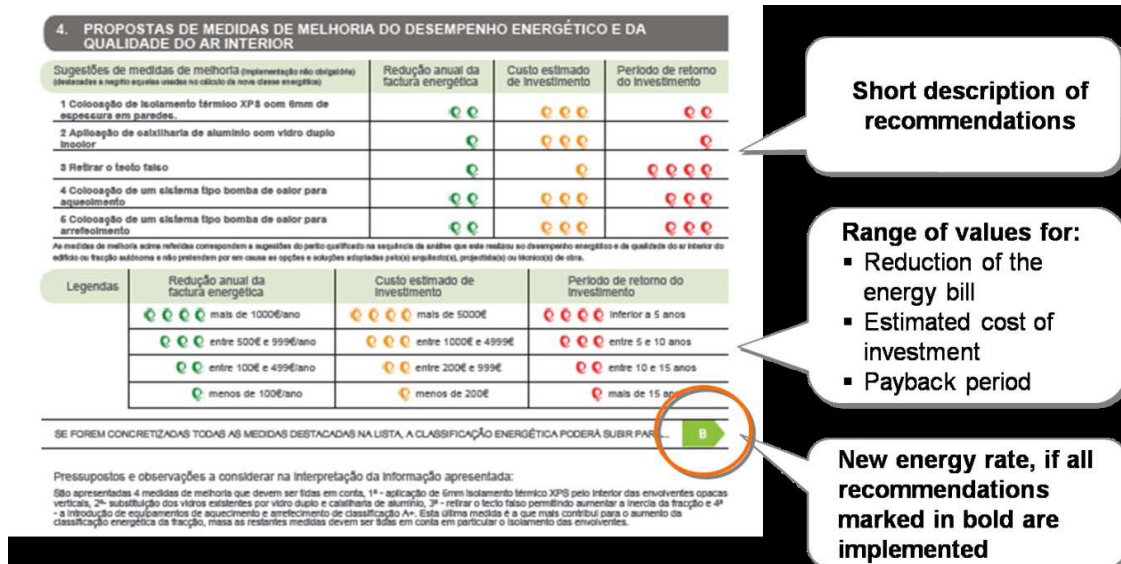
**Discussion:** Collecting data using a standardized methodology is critical to ensuring accurate energy models that result in asset ratings that can be accurately compared across buildings. For any building, identifying the performance of the envelope, efficiency of HVAC and hot water equipment, and lighting power density are

required elements, as are building site characteristics, such as orientation, solar insolation, shading, climate, etc. Additionally, although more complicated, it is necessary to objectively evaluate the actual condition and performance of energy assets and distribution systems.

**Recommendation:** It is clear that in addition to the collection of data and information from design documents, a site visit is critical to identify the actual building conditions, systems integration, and equipment performance. Questions remain, however, regarding the ability to record certain building and systems information in a standardized manner. The Team proposes working with national stakeholders (e.g. DOE, ASHRAE, COMNET, ASTM) to develop appropriate protocols for data collection.

### C. Building Energy Efficiency Recommendations Report (BEERR)

**Discussion:** As described above, the two main products associated with the rating process are an operational and asset rating/label and a Building Energy Efficiency Recommendations Report (BEERR). The BEERR can range from a list of generic recommendations applicable to virtually any building to a targeted and specific list of recommended measures for the particular building being assessed. The BEERR can provide a range of details on potential energy and cost savings, paybacks, and links to rating improvements and utility incentives. The BEERR is envisioned to be the basis for a more detailed project scoping and implementation plan that incorporates utility incentives and other financing opportunities.



Recommendations Report in Portugal, source: "Successful EPC schemes in two Member States: An ECEEE Case Study"

**Recommendation:** The Team regards the BEERR as an essential component of the assessment process. It should provide information that demonstrates the energy and cost benefits, as well as asset and operational rating enhancements, associated with a comprehensive set of efficiency improvements. Details of the report design and layout are to be determined.

### D. Quality Assurance

**Discussion:** Quality assurance is critical to the credibility and ultimate success of a labeling program intended to increase energy efficiency investments in buildings. Quality assurance is needed in all steps of the process including, but not limited to, assessor training and certification, energy asset modeling, and evaluation of energy efficiency improvement project measures.

### 1. Assessor training and certification

Commercial building assessment and asset rating will require certified professional field assessors/assessments as well as professionals certified to provide consistency in energy modeling. Existing institutions such as BPI and ASHRAE are working to develop protocols and certification programs for building on-site assessments and energy modeling. Based on experience with MEPA, the state's construction projects, and the ASHRAE bEQ pilot an experienced stock of trained professionals exist who can participate in the certification process.

### 2. Standardized Energy Asset Modeling

In order to ensure accurate and comparable asset ratings, there is a need to address variability in energy modeling. COMNET has created the "Commercial Buildings Energy Modeling Guidelines and Procedures," which is intended to provide inputs and specifications for software models to estimate more consistently the energy use of a building. COMNET plans to provide 1) a set of specifications for direct integration into energy modeling software, and 2) a related technical manual for use by energy modeling professionals that will receive a COMNET Energy Raters credential.

### 3. Verification of efficiency measures

The proposed approach of a post-project reassessment of the building asset rating using the same methodology as the pre-assessment provides an effective and whole building verification of the energy efficiency improvements and should facilitate integration with utility incentive programs.

**Recommendations:** The Team recommends working with stakeholders on both the energy assessment and energy modeling steps in the process. The program would require certification for both the building assessors and the energy modelers. Additionally, the Team anticipates collaborating with the U.S. DOE to develop any additional tools that will assure assessments and modeling quality.

## E. Cost Control

**Discussion:** Anticipated costs associated with the building labeling process are still to be determined, yet from the stakeholder discussions to date, it is clear that a balance must exist between ensuring a credible level of accuracy for energy ratings and efficiency measures and minimizing the costs of the asset rating assessment. The range of assessment costs are driven by two primary factors:

1. Building type, characteristics, and access to information (building sketches, modeling data), which can vary extensively between buildings (e.g., new buildings vs. existing buildings).
2. The level of the detail included in the asset rating assessment (e.g., ASHRAE Level 1 assessment vs. ASHRAE Level 2 assessment).

The coordination of both operational and asset ratings by a single assessor, and into a single site visit, can help provide greater value from participation in the program. In addition, ensuring tight integration with incentive programs and technical assistance (a "one-stop shop") can serve to minimize any redundancy in data collection, improve the customer experience, and increase the likelihood of investing in energy upgrades.

**Recommendation:** The Team recognizes that upfront costs are a significant challenge, and that a clear value proposition needs to be articulated to potential customers. In addition, the Team plans to integrate the building labeling process with utility incentive programs in order to make the energy investment process as simple as possible. The current plan is to offer buildings receiving an initial assessment and label a retrofit and financing package through the existing utility large commercial and industrial (C&I) retrofit programs, which currently subsidize up to 65 percent of the total cost of implemented measures.

***F. Identical Treatment for Existing and New Buildings***

*Discussion:* New buildings will have some advantages in adopting an asset rating due to the availability of design documents and in many cases energy modeling. This raises an issue whether the methodology for new buildings should differ from the one described above for existing buildings.

*Recommendations:* The Team will work with COMNET to finalize a consensus standard for generating energy ratings of both existing and new commercial buildings. The Team's goal is to treat existing and new buildings the same, with the conscious goal of measuring energy performance independent of a building's age, enabling stakeholders to accurately and directly compare the performance of buildings in the same category.

### Section 3: Proposed Pilot Implementation Strategy

In parallel with its consideration of technical issues associated with the development of an asset rating pilot program, the Team is formulating an implementation strategy that will guide the introduction of asset ratings into the commercial marketplace. The proposed strategy addresses key questions regarding program design as well as various issues related to program implementation.

In general, the Team proposes a phased approach to the introduction of a commercial building asset rating system, beginning with a two-three year pilot focused on one or more specific segments of the market, within a targeted geographical area. The intent is to use this pilot to evaluate an asset rating program from a technical and financial standpoint, in order to inform any broader implementation of a building labeling program. The remainder of this section describes how DOER proposes to structure and manage the rating system during this two-three year period, with a view to a future statewide program.

The following table summarizes the key components of a building labeling pilot program in the commercial sector:

<b><u>Building Energy Labeling Pilot Key Stages</u></b>
<b>Pilot Program Design</b>
<b>Set Up Steering Committee</b>
<b>Steering Committee Meetings</b>
<b>Integrate with Utility Incentive Programs and Plans</b>
<b>Asset Rating Modeling Guidelines Integrate into Pilot (with COMNET)</b>
<b>Assessment Protocol Development (with ASHRAE/ASTM/COMNET)</b>
<b>Finalize Label Design</b>
<b>Asset Label and Marketing Development</b>
<b>Audit and Modeling Training Protocol Development</b>
<b>Auditors and Modelers Training (with ASHRAE/COMNET)</b>
<b>Outreach to potential labeling program participants</b>
<b>Building Labeling Implementation Phase</b>
<b>Perform assessments for at least 25 buildings for Year 1</b>
<b>Issue Asset and Operational Labels for at least 25 buildings</b>
<b>Expand number and types of Buildings to be labeled</b>
<b>Monitor and Evaluate Pilot Implementation</b>
<b>Develop a Statewide Implementation Strategy</b>
<b>Implement Statewide program</b>

During the two-three year pilot phase, DOER and its partners will evaluate six main elements identified as part of the program design:

1. Program Participation
2. Integration with Operational Ratings
3. Cost Management
4. Program Management
5. Evaluation, Measurement, and Verification (EM&V)
6. Marketing and Outreach Strategy



The proposed parameters for each element are described below with initial recommendations.

### **3.1 Program Participation**

The Team's intent is to create a framework for the eventual inclusion of a broad array of commercial building types in an energy labeling program. Successful implementation and management of the pilot phase of the program is critical to the long-term success of a statewide program, requiring the Team to be deliberate in its consideration of the type, location, and number of buildings that should be included in the pilot phase.

#### ***A. Building type and location***

*Discussion:* Commercial buildings are widely variable in type, size, use, and ownership structure. As a result, the process of generating an energy label for a multi-use hospital building might be significantly more complex than an office building. Because there is no asset rating program in the U.S. it is important to start the pilot program with sectors of the real estate market for which development of an asset rating is relatively simple, and where an energy label could influence the market value of the property.

*Recommendation:* The Team believes the office sector and the multi-family rental sector as well as public buildings (e.g., state and municipal buildings) offer the best opportunity for launching a successful asset rating program. Building owners within these sectors actively look for ways to differentiate their properties to attract and retain high tenancy rates, are frequently interested in leading by example, and, as a result, can be expected to be among the earliest adopters of building labeling standards on a voluntary basis. Large commercial building managers in these sectors are also more likely to be conducting business in multiple commercial markets, and in some cases in Europe as well, where they may have developed relevant compliance expertise in response to relatively advanced building energy regulations. Office, multi-family, and public property owners have also been active participants in recent efforts to address relevant energy and environmental challenges, including:

- The Boston and Cambridge climate planning stakeholder processes;
- Governor Patrick's Zero Net Energy Buildings Task Force;
- The development and implementation of LEED zoning requirements in the City of Boston;
- The recent "Lights Out Boston" program;
- The Cambridge Energy Alliance's comprehensive retrofit and financing program; and
- DOER's High Performance Buildings Grant Program.

In short, commercial office and multi-family building managers have been some of the most engaged building owners in the region, and thus can be expected to provide a strong foundation for the first phase of an asset rating program.

The Team is taking steps to identify communities with a sufficient stock of applicable buildings that are also interested in piloting a rating and labeling program, and Boston and Cambridge, along with the Merrimack Valley area in northeastern Massachusetts, have emerged as interested partners. This geography includes some of the largest and densest commercial development in Massachusetts, and accounts for significant levels of peak summer and winter electricity loads, as well as a substantial portion of the total community greenhouse gas emissions. Additionally, commercial buildings in these communities (along with many others) are eligible for generous incentives offered by utility-sponsored demand-side management programs.

#### ***B. Pilot phase scale***

***Discussion:*** The desire to move aggressively toward development and adoption of building asset ratings must be balanced with the need to ensure manageability of the pilot phase. Although the asset rating program will lead directly to a substantial increase in the number of trained assessment and rating professionals, the fact that the market is at an early stage of development creates a constraint on the scale of the pilot phase. Therefore, the scale of the pilot should be set at a maximum manageable level. DOER submitted earlier this summer a funding proposal to the Department of Energy, which requested funds to establish a large scale asset rating for existing commercial buildings in metro-Boston. The proposal outlined a strategy for designing the pilot and then developing an asset rating in 450 buildings over the two-three years.

***Recommendation:*** The Team proposes to complete energy assessments followed by the development of an asset rating in at least 35 commercial office buildings in year one of a two-three year pilot. The Team is committed to identifying additional sources of funding to expand the pilot after year one.

### **3.2 Integration with Operational Ratings**

***Discussion:*** Currently, in the U.S. there is widespread understanding of and support for the use of operational energy ratings. As described above, several major commercial building markets have committed to requiring operational ratings, including New York City, Washington D.C., and California. While operational ratings provide useful information, particularly to the building operators, they can also complement building asset ratings intended to influence market valuation. Working with ASHRAE on its operational rating pilot has provided Massachusetts with valuable information about an alternative to ESPM, which will continue to be evaluated during the subsequent asset rating pilot phase.

***Recommendation:*** The Team recognizes that asset and operational ratings, while both important, serve complementary roles. Consequently, the Team proposes to implement both types of ratings and verify and monitor the asset rating through measurement of operational performance. Additionally, while ESPM is currently the most common operational rating used by several jurisdictions, the Team recommends seriously considering an ASHRAE bEQ type label as a possible alternative, given its use of zero net energy as the ultimate target performance and the ability to directly compare buildings against buildings in an easy to understand format.

### **3.3 Cost Management**

***Discussion:*** The Team recognizes that one of the primary barriers to widespread acceptance and implementation of a building energy asset rating is the potential cost associated with the comprehensive building assessment and energy modeling necessary to develop the rating. While costs may be relatively high during the first year or two of the pilot program, the Team anticipates using the pilot as a means to explore ways in which rating costs can be brought down to a reasonable and acceptable level. Some of the cost mitigation strategies under consideration include:

- Full integration with utility incentive programs to take advantage of existing assessment protocols and available financing.
- Rapid expansion of a pool of available raters and assessors such that experience and competition bring down costs.
- Integration with operational data to streamline the asset rating process and increase its accuracy.
- Incorporation of multiple labels and certifications into one process, including asset and operational labels, EnergyStar Portfolio Manager score, and energy points in LEED certification, for those buildings who wish to pursue all these efforts.

- Exploration of innovative technologies and processes that may not require the same level of on-site, detailed assessment and that would dramatically speed up the rating process for large numbers of buildings.
- Creation of expedited permitting incentives for building owners willing to participate in the program.

**Recommendation:** The Team recommends continuation of work already begun with the utilities to ensure that labeling efforts are fully integrated with the utility incentive programs. In addition, the building sector is an area of rapid technology change, and the Team commits to working with firms to identify and test new technologies and assessment strategies that may reduce rating costs over time.

### **3.4 Program Management**

DOER will assume primary responsibility for the implementation of the pilot phase work, though it will do so by continuing to work closely with its utility partners. NSTAR and National Grid, which together serve most customers in Massachusetts, will be DOER's primary utility partners, serving as the primary delivery mechanism for both labeling services and energy retrofits. By leveraging the efficiency service delivery infrastructure that is currently providing efficiency resources to commercial building owners in the region, the DOER building labeling initiative will be able to significantly lower program startup costs.

National Grid and NSTAR are already implementing coordinated three-year energy efficiency plans, and have an established partnership to provide joint energy efficiency programming for commercial and industrial customers in regions where their territories overlap. The DOER commercial labeling program will be able to take advantage of this new coordination to provide a comprehensive, fuel blind, design, retrofit, and financing package to all program participants.

The results of the pilot program will help determine the most appropriate structure for any future building labeling program.

### **3.5 Evaluation, Measurement, and Verification (EM&V)**

Each building participating in the asset rating program will be required to make operational data available and obtain a rating from either the EnergyStar Portfolio Manager or the ASHRAE bEQ. Participating building owners will be required to input both pre- and post-retrofit data into this publically available rating system. In addition to operational ratings, DOER intends to maintain a database of asset rating assessment and modeling data, which would be used as a tracking mechanism as well as a resource for future evaluation and analysis. By requiring an operational rating as part of the labeling program, the program can evaluate the value of performing both types of ratings at the same time and identify the extent to which both ratings are necessary for successful prioritization and implementation of energy improvements.

In addition to monitoring and verifying the results of building-level retrofit measures and the efficacy of the asset rating tool, the Team is committed to rigorous evaluation, monitoring, and verification of the program as a whole both to ensure program efficiency and clarity and to maximize the program's results. Though the details of this EM&V effort have not yet been determined, it will be designed to allow DOER and its program partners to answer important questions, including:

- Has the asset rating and labeling program resulted in greater or broader uptake of energy efficiency measures?
- Do efficiency measures directly result in building valuation increases?

- Do asset ratings and labels directly result in increased occupancy and retention rates?
- Has the asset rating and labeling program been effectively integrated with utility incentive programs?
- Has the program resulted in, or at least catalyzed, the creation of a qualified, and sufficiently large, cadre of assessment professionals?
- Have program costs been in line with expectations?

Since most if not all the labeling efforts will occur as part of utility incentive programs, the Team recognizes that any effective EM&V effort will need to be integrated with those programs and developed in concert with utility staff.

### 3.6 Outreach Strategy

The pilot's goal is to demonstrate the use of an energy label as a means to drive further investment in energy efficiency within the commercial building sector. In order to facilitate this investment from commercial building owners and property managers, the pilot will prioritize seamless integration with utility energy efficiency incentives and rebate programs, and incentives for both new and existing buildings, including the following components:

- Customized assessments and technical assistance in the selection of appropriate retrofit measures.
- Use of post-retrofit assessment to revise energy ratings and determine the final incentive level from utility programs.
- New Construction - Public recognition through the labeling grade. A letter grade or similar scale will motivate new building and major building retrofit projects to prioritize energy efficiency from the design phase throughout the life of the building.
- Existing Building Retrofits - Public recognition for "Energy Leaders." Owners and manager of existing buildings that succeed in significant energy retrofits (e.g., 20 percent reductions in energy use) will be publicly recognized through a new program tentatively titled the "Energy Leaders Club."

While the goal of the pilot program is to work closely with a group of stakeholders within the commercial office building sub-sector, DOER is also committed to a broader marketing and outreach effort as part of pilot phase implementation. This additional effort will be critical to establishing the foundation for asset rating implementation throughout the commercial real estate sector. In general, marketing and outreach comprise three objectives:

- Identifying special conditions and constraints that may exist in those sectors and act as barriers to participation.
- Achieving early "buy-in" from those who would be affected, directly or indirectly, by a future energy labeling program.
- Educating the broader marketplace, and the public, about the benefits of building energy ratings and the means by which they would be developed and maintained.

While DOER has not yet developed a formal marketing and outreach plan, it is in the process of considering such a plan's primary elements and how they might be customized, as necessary, to reach different stakeholders most effectively. In particular, DOER is considering the role, scope, and specifics of "general" information and "program" information. General information would focus on establishing the "business case" for asset ratings and the importance of measuring a building's rated performance to drive additional energy- and cost-saving improvements. Program information would focus on the specific programmatic parameters and provide guidance to ease implementation.

## Section 4: Future Program Framework

Following the two-three year pilot phase, DOER and its partners will evaluate whether and when to expand to a more comprehensive statewide program that would likely phase in additional building categories and refine the assessment methodology. Building on the design of the pilot program discussed in Section 3, the following additional elements are identified as a framework for discussion:

1. Program Scope (including building types)
2. Voluntary vs. Mandatory Participation
3. Initial Program Triggers
4. Renewal of Program Triggers
5. Access to Building Rating Information

### 4.1 Program Scope

The Team's intent is to create a platform for the eventual inclusion of nearly all Massachusetts commercial buildings in an asset rating program. During the pilot phase, the Steering Committee will consider the types and locations of buildings to design a phased approach to broaden program coverage. Healthcare, laboratory, and mixed-use commercial buildings are all important sectors of the commercial market in Massachusetts. The program will be looking to phase-in program participation for these and other building types.

### 4.2 Voluntary vs. Mandatory Participation

*Discussion:* The Team recognizes the benefits of piloting a voluntary labeling program in order to test effectively and improve the program design. While starting with a voluntary approach, multiple stakeholders would have recognized the value in transitioning to a mandatory program to ensure a level playing field and broad that would truly impact the market. The experience with building labels in Europe in particular has demonstrated that a voluntary program is less effective than a mandatory requirement, while analyses such as those contained in the NEEP/Dunsky report clearly point to a mandatory program as the most equitable and effective strategy. Additionally, some building operators have expressed a preference for mandatory programs as it ensures that all buildings are treated equally.

The Team also notes the common misconception that mandatory programs are more expensive and could result in harming the commercial real estate market. In fact, standard commercial leases generally permit building owners to pass through to tenants any requirements imposed by law, meaning that any costs associated with a mandatory labeling program could be paid for through very small, minor increases in tenant rents, making such a program more affordable and palatable.

*Recommendation:* While the team recognizes and appreciates the concerns associated with a mandatory program, it believes that this decision is a critical one that will only need to be made following an evaluation of the pilot and determination as to whether an asset rating program is deemed effective. The decision as to whether to transition a voluntary pilot into a mandatory program will be made with significant stakeholder input and analysis regarding the associated costs and benefits.

### 4.3 Initial Program Triggers

*Discussion:* The point in a building's life cycle at which an asset rating could or should be developed is an important consideration. A common goal of easing implementation strongly suggests attaching asset rating development to transactional or other events that should benefit from increased knowledge of energy use and performance. Several options exist, including:

- **Time of Sale:** Prior to a sale, the buyer will customarily review building documentation as part of the due diligence process. The addition of energy use documentation, though not currently commonplace, could become standard practice and serve to initiate the assessment and labeling process.
- **Time of Leasing:** Due diligence associated with leasing of individual tenant spaces is typically less rigorous than that associated with a sale, but could be expanded to include a focus on energy use. The lease structure can include an implementation mechanism to improve the building's energy performance. However, unless all or nearly all of a building is to be leased, it would be appropriate only to assess the relevant portion of the building, which runs counter to the concept of a whole building asset rating.
- **Financing:** Other than an appraisal of value, financing prompts less due diligence than a sale. Therefore, a financing trigger would likely need to incorporate a minimum dollar value and a minimum percentage value of the asset.
- **Energy System Replacement or Rehabilitation:** A building system change that triggers energy-related provisions of the Massachusetts State Building Code (which now reference the International Energy Conservation Code and ASHRAE 90.1) and that results in a material change in the building's energy consumption (for example, due to a change in the building's primary use), would also be an appropriate trigger for assessing and labeling.

***Recommendation:*** For discussion purposes, the Team proposes to base establishment of initial asset ratings on the following general parameters:

- All commercial buildings greater than or equal to [10,000] square feet in size must develop an initial asset rating in conjunction with specific "trigger events" (see below) but in no case more than 10 years after a designated program start date.
- Program start dates will be established sequentially for discrete commercial building types; the program would launch with a focus on one or two of these types.
- The program start date will be established no sooner than the completion of the two-three year pilot phase.

Four events are proposed to serve as triggers for the establishment of an initial asset rating:

- **Sale.** An asset rating will be established prior to the publication of any advertisement that a building is for sale.
- **Lease.** An asset rating will be established prior to execution of any lease (i.e., new tenant or renewal) for at least 50 percent (or possibly greater) of a building's leasable area or comprising at least 50,000 square feet.
- **Financing.** An asset rating will be established prior to completion of a financing transaction, subject to minimum thresholds (to be determined) for both total deal value and deal value as a percentage of the building's asset value.
- **System modification.** An asset rating will be established upon completion of any building energy system modifications that trigger Massachusetts State Building Code requirements.

#### 4.4 Renewal of Program Triggers

***Discussion:*** Periodic renewal of asset ratings will be important to maintaining their credibility and utility within the marketplace. At the same time, the Team recognizes that requiring a rating renewal too frequently would not be a cost-effective use of resources.

***Recommendation:*** The Team proposes the following guidelines for the timing of asset rating renewals following the initial asset rating:

- Absent any trigger events, renewal will occur within 15 years following the initial or any subsequent asset rating.
- Between 10 and 15 years following the establishment of an initial or any subsequent asset rating, the asset rating will be renewed if any of the trigger events described above occur.
- Within 10 years following the establishment of an initial or any subsequent asset rating, the rating will be renewed if changes in building use result in a 20 percent or greater increase in building energy demand.

#### **4.5 Access to Building Ratings**

***Discussion:*** The Team anticipates creating a database of asset ratings and supporting information that could be used for evaluation purposes once ratings exist in sufficient number to be representative of one or more commercial building categories. Some, but likely not all, of this information should be publicly available and specifically made available to building appraisers and linked directly to real estate listings. At the same time, the Team recognizes that the value of public disclosure must be balanced with confidentiality considerations and that unrestricted access to detailed building-level energy usage and performance data associated with an asset rating may not be appropriate. The extent to which asset rating information will be disclosed will be the subject of further discussion.

***Recommendation:*** Upon completion of post-retrofit assessments, building owners will be offered public recognition as an “energy leader” based on (1) their willingness to disclose their new building label, (2) achievement of a projected 20-percent reduction in energy use (as illustrated by the change in the asset’s rating), or (3) if the rating achieves a certain level of performance. DOER will work with its project partners to develop a web-based disclosure database that will clearly communicate label information and allow future building owners or potential tenants to compare energy performance across buildings. The database will be structured to be highly scalable and will be designed so that other states or local jurisdictions will be able to use the label disclosure web platform.

## **Section 5: Next Steps**

The work on this report has demonstrated the complex nature of developing an asset rating for a building energy labeling program, emphasizing the need for further evaluation and broadening stakeholder outreach.

### **5.1 Stakeholder Feedback**

DOER intends to engage stakeholders, local, national and international, in reviewing this document, soliciting feedback on the key technical issues associated with an asset rating and the design elements of an implementation strategy. In parallel, DOER plans to establish a national Steering Committee that will invite representatives from the U.S. DOE, state energy offices, national organizations, utilities, commercial building trade associations and owner representatives that will be asked to support development of a strategy for implementing the initial two-three year pilot program, monitoring the results, and initiating efforts to design a longer-term plan.



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